WQB "Wide Aperture Quad" for Main Injector

22 April 2004
IB2 conference room
9:00 AM

Attendees: Leon Bartelson, Bruce Brown, John Carson, Weiren Chou, TJ Gardner, Dave Harding, Dave Johnson, Vladimir Kashikhin, Gregg Kobliska, François Ostiguy, John Zweibohmer

After a discussion with a steel vendor, we are convinced that the sample measured in December is typical of what we will receive if such is specified. Vladimir has defined a minimum permeability at five excitations and has allowed a coercivity of 2.4. Material Control will be meeting with a vendor who can do the slitting and coating in one operation, saving some cold working.

Vladimir showed a lamination based on the new steel properties and on some tailoring of the field shape with pole tip adjustments. The outside dimensions of the lamination can be trimmed to about 280.5 mm, and the field linearity with current is still better than the Main Injector quadrupoles. This prompted the question of whether the aperture could be increased further. There would be an incremental increase from six turns to seven, leading to an 8.0% increase in the aperture, or about 4 mm in the pole radius, 8 mm in the diameter. The pole tip field would increase proportionally, which would not be a problem as it is currently close to 1.0 T, but in the pole the field already reaches over 2 T, so there is some concern. After a lengthy discussion, the potential aperture increase was deemed sufficiently exciting as to warrant further investigation. Gregg assured us that on the time scale of several weeks we can start the steel requisition now and make a minor change to the width of the slits and the weight of the order when we are more sure of what we want. Even if the delivery slipped, the laminations should be here by the end of the 2004 shutdown when work is expected to begin. Leon assured us that the trim power supplies were bipolar, relieving any concern that we need to stay on one side of the saturation curve through the whole ramp.

The end field will need to be considered carefully in order to match the integrated field to the existing magnets. Francois agreed work with Vladimir on that question once we have a better idea of the lamination profile. We will also look at removable end packs to allow modifications based on measurements of the first magnet. It may be profitable to study the end field of the IQD that is nearing completion. Bruce and Dave H will talk with Hank Glass about the possibilities.

If the aperture is increased, the beam tube issue is reopened. We may well need to procure new tubes rather than use existing 4Q120 tubes. We will explore reworking the existing tubes, moving metal from the top and bottom to the sides.

Next meeting in two weeks: Thursday, 6 May 2004. Same time, same place. We plan to look at the effect of increasing the number of turns and decide whether the increased aperture is worth any negative side effects that Vladimir may identify.